

Larval habits of *Teichobia-verhuellella*, Stainton.

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My first acquaintance with this species was made at Niton, near Ventnor, in the Isle of Wight, where I found the larvae on Hartstongue Fern, and subsequently bred several moths, but I did not then notice the interesting habits of the larva, which actually moves its dwelling from old pastures to new like a nomad. In 1923 I again met with the larvae in plenty at Badenweiler, in the Black Forest, where I spent the winter, and was pleased to find them again on the Bürgenstock, a mountain near Lucerne. Here they were living in an even more natural state than at Badenweiler, as they inhabited limestone rocks instead of stone walls made by man.

Teichobia verhuellella, Stainton, is on the whole a somewhat primitive species with an ill-developed tongue, two-jointed maxillary palpi, all veins present and separate, and unicolourous wings, while the larva mines in an ancient type of plant.* Rebel, in Staudinger and Rebel's Catalogue, 1901, places it in a subfamily by itself, the *Teichobiinae*, and it appears to have no very near relations. It appears to be distributed over Central and Western Europe, and I believe it has been recorded from the United States of America. Near Ventnor it occurred at a few feet above sea level, on the Bürgenstock at 3,000 feet, and Zeller found it at Bergün, in the Engadine, at over 4,000 feet. The larva mines in the fronds of certain species of fern in its earliest stages, and later lives under a cover of silk and fern spores. I will begin my observations on the larvae I found at Bürgenstock. On August 28th, 1923, the first mine was seen, but I could find no trace of the egg on this one, nor on any of those found subsequently.

The first mine is a blotch mine, more or less triangular in outline, quite flat, and pale brown in colour. The larva has a pale ochreous head and a pale greyish ochreous body, but my lens would not show me more of this creature, some 0.5mm. in length. It lives entirely in the mine, eating out the green tissue. Here I believe it undergoes its first change of skin, and then continues to feed for a time in the same mine. Whether in the first stage it can leave the mine and form a new one I do not know, but it certainly is able to do so in the second stage. These mines were in *Asplenium ruta-muraria*. On September 3rd I found a larva in the second stage on a leaflet of a frond of *Asplenium viride*. It had just mined out sufficient space to enclose its body. Above, on the opposite side of the stalk, was the leaflet containing the first mine which the larva had vacated. Three days later I left Bürgenstock, and was unable to make any further observations. As the leaflets of these *Asplenium* ferns are often very small, I should suppose that the larva makes two mines at least before hibernation. It may, however, be content with one mine when feeding in the large fronds of Hartstongue. Whether the larva passes the winter in the mine, as I think probable, or whether it leaves the mine and hides away till the spring, is a problem I have not yet solved. I will now go back to my observations at Badenweiler, in the spring of 1923. There was a fair amount

* Compare Meyrick, *Handbook*, p. 777.

of *A. ruta-muraria* on the walls of the villages in the neighbourhood, and I intended looking out for the larvae in April, as Tutt gives that month for finding it in England (*Practical Hints*, Vol. III.), and as Badenweiler is about 1,200 feet above the sea, I thought the species would not be earlier there. However, happening to be in the village of Niederweiler, on February 26th, I saw a good patch of the fern, and, on examination, I was surprised to find several larvae under their covers, all in the last stadium. From time to time others were found in various places, some on Hart's-tongue, which was not very common in the district, and a few on *Asplenium trichomanes*, which was abundant but is, I fancy, a less suitable food-plant than the other species above mentioned. It was not till March 22nd that I was able to find any larvae in the penultimate stage. These occurred on the highest and most exposed position that I searched, and on *A. trichomanes*. They had already left the mines and were living under their covers just like those in the last stage. In these two last stages the larvae live on the underside of the fronds, not in a case as some authors state, but under a tent or cover made of the spore capsules of the fern. It may not be wrong to call the dwelling a case, but I prefer the word cover, as it is entirely different from the cases of Coleophorids, Psychids, or Adelids. When examining the fern I first noticed, the pale patches on the upper-side of the leaflets where the larvae had been mining. On turning over the fronds I saw the covers spun on to the underside of the leaflets. They are formed of the spore cases of the fern and silk enough to hold them together, so that they are exactly the same colour as the groups of spores, and but for their size and irregular position they might be readily passed over. When on *Asplenium*, where the leaflets are small, the covers usually are spun across two leaflets, so that they are easily seen. The shape of the cover may be likened to that of a rowing boat in reversed position, but without a keel. At rest the larva is very plump and the cover appears to house it conveniently. The edges of the cover are fastened to the fern, but there is an opening at each end. With its body hidden under the cover, the larva bites through the lower cuticle of the leaf and mines patches out of the interior. It places its excrement outside the cover at the more exposed end. When the fronds in the tin box, where I kept the larvae, began to get dry, I put fresh ones in and took the larvae out of their covers, placing them on the fresh fronds. They soon began to form new covers by biting off the spore cases and spinning them over their bodies. One was quite hidden in three hours, while another was still half exposed at the end of that time. In my walks I frequently found the covers, and began to notice that these often occurred on leaflets where the spore groups had not been disturbed. This puzzled me, as I was still under the impression that when a larva moved to a fresh leaflet it there formed a fresh cover. I did not then know that it usually took its cover with it when it moved. Finding that the fern dried up rather quickly in the tin box, I gathered some fronds with long stalks and placed them in a small glass tube with a little water at the bottom, and as the larvae were sluggish no cork was needed. Here they did very well, and I could observe them without disturbance. One evening on looking at them I noticed two larvae crawling down the stalk of a frond and underneath each was a flat piece of their covers. The progress was slow, and in the failing

light I could not make out how the cover was carried and kept in position just below the larva. I thought that perhaps the larva had spun the cover to its body, but I induced one larva to crawl beyond its cover, and finally it fell into its cover. I then saw the cover was fastened to the stalk. The cover when carried by the larva is rather flat, more or less quadrilateral in shape, and rather stiff by reason of its silk lining. So far as I could see, the larva after spinning one corner of the cover to the stalk, seized the opposite corner in its strong jaws, pushed it forwards and fastened it. Then cutting loose the first corner moved that forward again. In this manner slow progress was made. The larva is strong for its size. Unfortunately I never saw the larvae on the move in a good light. On one occasion I placed a larva and its cover on a fresh frond, but the cover fell a short distance away from the larva. Being in a hurry I left it where it fell. When I looked again I found the larva had fetched its cover and spun it on to the fern in another place. When on the growing fern I do not suppose the larva moves frequently, as it is quite a small one when fully grown, and not of an active nature. When about to spin up, it either crawls down among the fern stalks or finds its way on to the wall or rock, as the case may be, and of course carries its cover with it, as this is made use of for the cocoon. In the open I have found one cocoon on the stone of a wall and two on the stalks of fern. Of those I had in captivity four spun up on the fern and two on the glass tube. The cocoon is firmly attached and has more silk on the floor than the cover. It retains the same colour and shape, but may be recognised by a ridge, which runs along the top. Its colour is light brown, its length about 7mm., and its width about 2mm. The larva lines the sides of the cocoon thickly with whitish silk, nearly up to the ridge. Thus, at the top of the rather stiff sides, there is a strip of loose material, which gets pinched up to form the ridge. My larvae spun up during the first fortnight in April, except one, which must have done so earlier, as the moth appeared on April 26th. This was abnormally early. The last one bred appeared on June 9th, and June and July are given as the usual months when the moth is on the wing. When the moth is about to emerge the pupal shell is thrust out of the cocoon as far as the third abdominal segment. I have not found the moth in the open, but those I have bred never showed any activity.

The full-grown larva is pale ochreous, short and stout when at rest, but when feeding the anterior segments are stretched out and become much flattened. Head black, clypeus marked out with yellow, prothoracic shield black with pale anterior collar, and divided by a yellow suture. Legs short, black. Four pairs of abdominal prolegs with complete ring of crotchets. The claspers have a horse-shoe of crotchets. There is a black anal shield. Length at rest about 5-6mm. On the meso- and meta-thorax tubercles i and ii are on a common plate. On the first and second abdominal segments the pair of tubercles i are closer together than the pair of ii, as in most lepidopterous larvae. On the third abdominal the pairs are of equal distance apart, but on the fourth and subsequent segments tubercles i are wider apart than tubercles ii. This arrangement is not uncommon in some of the *Tineina*. The larva in the penultimate instar has the head deep olive brown, without yellow marks, and the prothoracic shield olive brown,

very faintly divided by a paler line. Otherwise the larva resembles that of the final instar. Length about 3mm.

The pupa, about 4mm. long, is light ochreous and rather stout. In the ♂ the abdominal segments 3, 4, 5, 6 and 7 are free. The antennae, wings, and third pair of legs come down as far as the 7th abdominal. The prothorax is about double the size of the dorsal headpiece, showing that the pupa does not belong to the Adelid-Tineid series. The tongue is very short, maxillary palpi very conspicuous below the eyes. Some of the abdominal segments appear to have the upper row of dorsal teeth. On the dorsum of the ninth abdominal there is a pair of strong spines, slightly curved upwards, which probably help to hold the lower part of the pupal shell in the cocoon while the moth is emerging from the upper exposed portion. I could not with my lens make out any setae.

From the foregoing it may be gathered that the larva is purely a leaf-miner and does not eat the fructification of the fern, that it has four instars and hibernates in the second. I believe now that it leaves the mine before winter.

Of the food-plants *Phyllitis scolopendrium* is no doubt useful. Its large fronds provide ample mining space. A possible disadvantage may arise from its flat leaves offering little means of concealment. The larval cover is usually placed either between the long rows of spores or adjoining one of them. The larval mine is fairly conspicuous on the green upperside of the frond. The common Wall Rue, *Asplenium rutamuraria*, especially where it grows in thick tufts, is a convenient food-plant. The leaflets are sufficiently thick and sappy to afford good mining material, and the numerous fronds provide shelter for the larval covers, the cocoon, and the perfect insect. The fronds mostly remain green throughout the winter, except where they are exposed to severe frost; by June and July the young fronds are of sufficient size to accommodate a small mining larva. These plants sometimes grow on old walls in towns, but then are usually so covered with the webs of spiders as to be unsuitable to moths. Besides *T. verhuellera* I have found, not uncommonly, a yellow dipterous larva mining the leaves. One I bred was a slender gnat-like insect. *Asplenium trichomanes* is also an abundant fern in the limestone districts of Germany and Switzerland, and it often grows in fairly thick tufts. The leaflets are thin and rather dry, and do not appear to be so suitable for a mining larva as the leaves of the wall rue. The moth seems to prefer the latter plant for oviposition. *Asplenium viride* is a more local species and prefers higher elevations. The leaflets are also small, but they contain more sap than those of *A. trichomanes*. It is a delicate plant, and many of the fronds wither during the winter. *Ceterach officinarum* is quoted as a food-plant. It is rather a local species, but it looks suitable, though the mine would be conspicuous on the even green upperside of the frond. I should much like to find the larva on this in order to see if it used the scales, which thickly cover the underside of the fronds, in forming its habitation.

Bruand stated that the larva fed on "capillaire." This word seems to have puzzled the entomologists of the Staintonian period, but according to Frey it is a collective term for the species of the genus *Asplenium*.